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PROCEEDINGS.

Eight hundred and seventy-fifth Meeting.

May 8, 1895. — ANNUAL MEETING.

VICE-PRESIDENT B. A. GOULD in the chair.

The chair announced the death of James Dwight Dana and John Newton, Associate Fellows.

The Corresponding Secretary read the following letters: from Sir F. Pollock, acknowledging his election as Foreign Honorary Member; and from the Natural History Society of Bonn, announcing the death of its Curator, Reinhard Peck.

The Corresponding Secretary read the Report of the Council.

The Report of the Treasurer was read and accepted. The following is an abstract.

GENERAL FUND.

Receipts.

Balance, May 1st, 1894		\$2,301.55
Sale of rights, Mass. Cotton Mills		30.50
		<u>2,332.05</u>
Assessments	\$975.00	
Sale of publications	48.52	
Subscriptions for publications	<u>461.00</u>	\$1,484.52
Investments		3,847.50
Return of bank tax		51.40
Gift of E. C. Clarke		<u>600.00</u>
		5,983.42
		<u>\$8,315.47</u>

Expenditures.

General expenses	\$2,630.26	
Publishing expenses	1,788.29	
Library expenses	<u>1,221.68</u>	\$5,640.23
Balance		2,675.24
		<u>\$8,315.47</u>

RUMFORD FUND.

Receipts.

Balance May 1st, 1894		\$4,110.21
Investments	\$1786.00	
Return of bank tax	97.55	1,883.55
		<u>\$5,993.76</u>

Expenditures.

Books and binding	\$120.06	
Rent	10.00	\$130.06
Balance		5,863.70
		<u>\$5,993.76</u>

WARREN FUND.

Receipts.

Balance, May 1st, 1894		\$334.89
Income		840.00
		<u>\$1,174.89</u>

Expenditures.

Investigations		\$800.00
Balance		374.89
		<u>\$1,174.89</u>

BUILDING FUND.

Receipts.

Balance, May 1st, 1894		\$418.68
Income		425.00
		<u>843.68</u>
Balance		843.68
		<u>\$843.68</u>

On the motion of William R. Livermore, it was

Voted, That the thanks of the Academy be tendered to the Treasurer for his timely gift of six hundred dollars for clerical assistance.

The Librarian made a verbal report on the condition of the library, by which it appeared that 2,773 books and pamphlets were added to the library during the past year, of which 1,866 were obtained by gift and exchange, 645 purchased with the appropriation from the General Fund, and 262 with the appropriation from the Rumford Fund. 465 volumes were

bound at an expense of \$580.15, \$35.80 of this amount being charged to the Rumford Fund. The total expenses for books, periodicals, and binding amounted to \$1,326.68. There were 242 books borrowed from the library by 32 persons, of whom 23 were Fellows of the Academy.

The following reports were presented :—

Report of the Rumford Committee.

The Academy voted at the annual meeting, May, 1894, to appropriate the sum of one thousand dollars from the Rumford Fund to be expended at the discretion of the Rumford Committee in aid of investigations in Light and heat, payments from this sum to be made on the order of the chairman of the Committee. The Committee has made the following appropriations from this sum :—

\$250 to Professor Nichols of Cornell University for investigations in the radiations from carbon at different temperatures.

\$250 to Professor E. H. Hall of Harvard University, in aid of his investigations on the thermal conductivity of metals.

\$250 to Professor Webster of Clark University, in aid of an investigation upon the relation between the velocity of light waves and electrical waves.

The Committee has also voted to approve the purchase of such volumes of the Memoirs of the International Bureau of Weights and Measures as are needed to complete the set in the library of the Academy, and has also passed the following votes :—

Voted, To recommend to the Academy to appropriate \$250 to Professor B. O. Peirce in further aid of his investigation on the thermal conductivities of poor conductors.

Voted, To recommend to the Academy to appropriate \$2,000 to the Rumford Committee to be expended at the discretion of the Committee in aid of investigations in Light and heat, payments from this sum to be made on the order of the chairman of the Committee.

Voted, For the second time to recommend to the Academy that the Rumford Medals be awarded to Thomas A. Edison, for his investigations in electric lighting.

JOHN TROWBRIDGE, *Chairman.*

Report of the C. M. Warren Committee.

8 May, 1895.

In behalf of the C. M. Warren Committee, I have to report that during the past year a grant of six hundred dollars (\$600) has been made to Professor C. F. Mabery, of Cleveland, Ohio, in aid of his investigation of American and Canadian Petroleum, and a grant of two hundred dollars (\$200) to Professor F. C. Phillips, of Allegheny, Pa., in furtherance of his researches on Natural Gas.

F. H. STORER, *Chairman.*

A report of the Committee of Finance was read and accepted.

On the recommendation of the Committee of Finance, it was

Voted, To appropriate nineteen hundred dollars (\$1,900) for general expenses.

Voted, That an appropriation of thirteen hundred dollars (\$1,300) be made to the Librarian, and that this appropriation cover also the petty expenses of the Assistant Librarian.

Voted, That an appropriation of eighteen hundred dollars (\$1800) be made for Volume XXX. of the *Proceedings*, now in press, provided that a part of this sum be expended for plates.

Voted, That an appropriation of four hundred dollars (\$400) be made to be used in the preparation of the plates and printing the text of Roland Thaxter's Memoir on the Laboulbeniaceæ.

On the recommendation of the Rumford Committee, it was

Voted, To appropriate the sum of two hundred and fifty dollars (\$250) from the income of the Rumford Fund to B. O. Peirce, in further aid of his investigation on the thermal conductivities of poor conductors.

Voted, To appropriate from the income of the Rumford Fund the sum of two thousand dollars (\$2,000), to be expended at the discretion of the Rumford Committee in aid of investigations in Light and Heat, payments from this sum to be made on the order of the chairman of the Committee.

Voted, To award the Rumford Premium to Thomas Alva Edison for his investigations in electric lighting.

On the recommendation of the C. M. Warren Committee, it was

Voted, To appropriate six hundred dollars (\$600) from the income of the C. M. Warren Fund to C. F. Mabery, of Cleveland, Ohio, to aid him in continuing his researches on the chemistry of petroleum.

On the motion of the Treasurer, it was

Voted, That the assessment for the ensuing year be five dollars (\$5).

On the recommendation of the Committee on amending the statutes, it was

Voted, To amend chapter 10, section 2, line 8, of the statutes, by changing the word "eight" to "seven."

The following gentlemen were elected members of the Academy:—

Arthur Gordon Webster, of Worcester, to be a Resident Fellow in Class I., Section 2 (Physics).

Arthur Michael, of Boston, to be a Resident Fellow in Class I., Section 3 (Chemistry).

John Fiske, of Cambridge, to be a Resident Fellow in Class III., Section 3 (Political Economy and History).

William Price Craighill, of Baltimore, to be an Associate Fellow in Class I., Section 4 (Technology and Engineering), in place of the late William Helmsley Emory.

The annual election resulted in the choice of the following officers:—

ALEXANDER AGASSIZ, *President*.

BENJAMIN A. GOULD, *Vice-President for Class I.*

GEORGE L. GOODALE, *Vice-President for Class II.*

AUGUSTUS LOWELL, *Vice-President for Class III.*

CHARLES L. JACKSON, *Corresponding Secretary*.

WILLIAM WATSON, *Recording Secretary*.

ELIOT C. CLARKE, *Treasurer*.

HENRY W. HAYNES, *Librarian*.

Councillors.

BENJAMIN O. PEIRCE,	}	of Class I.
HENRY MITCHELL,		
LEONARD P. KINNICUTT,		
BENJAMIN L. ROBINSON,	}	of Class II.
HENRY W. WILLIAMS,		
HENRY P. BOWDITCH,		
ANDREW M. DAVIS,	}	of Class III.
THOMAS W. HIGGINSON,		
JAMES B. THAYER,		

Member of Committee of Finance.

AUGUSTUS LOWELL.

Rumford Committee.

JOHN TROWBRIDGE,	EDWARD C. PICKERING,
ERASMUS D. LEAVITT,	CHARLES R. CROSS,
BENJAMIN O. PEIRCE,	AMOS E. DOLBEAR,
BENJAMIN A. GOULD.	

C. M. Warren Committee.

FRANCIS H. STORER,	HENRY B. HILL,
CHARLES L. JACKSON,	LEONARD P. KINNICUTT,
SAMUEL CABOT,	ARTHUR M. COMEY,
ROBERT H. RICHARDS.	

The chair appointed the following Standing Committees:—

Committee of Publication.

CHARLES L. JACKSON,	WILLIAM G. FARLOW,
WILLIAM W. GOODWIN.	

Committee on the Library.

SAMUEL H. SCUDDER,	AMOS E. DOLBEAR,
G. STANLEY HALL.	

Auditing Committee.

HENRY G. DENNY,	JOHN C. ROPES.
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Henry W. Williams read an obituary notice of Hermann von Helmholtz.

The following papers were presented by title:—

On the Thermal Conductivities of certain poor Conductors.
By B. O. Peirce and R. W. Willson.

On the Simultaneous Partial Differential Equations:

$$\frac{(Dy\xi)^2 - a^2(Dx\xi)^2}{Dy\xi} = f(\xi);$$

$$a^2 D^2 x\xi - D^2 y\xi = 0.$$

By B. O. Peirce.

On certain Derivatives of unsymmetrical Tribrombenzol.
By C. L. Jackson and F. B. Gallivan.

Trinitrophenylmalonic Ester. By C. L. Jackson and J. I. Phinney.

On Phenoquinone. By C. L. Jackson and G. Oenslager.

On the Nitrite of Bromdinitrophenylmalonic Ester. By C. L. Jackson and J. H. Moore.

On Dinitrobromtluol and some of its Derivatives. By C. L. Jackson and M. H. Ittner.

Contributions from the Gray Herbarium of Harvard University, New Series, No. 9:—1. On the Flora of the Galapagos Islands, as shown by the Collections of Dr. G. Baur. 2. New and noteworthy Plants, chiefly from Oaxaca, collected by C. G. Pringle, L. C. Smith, and E. W. Nelson. 3. A Synoptic Revision of the Genus *Lamourouxia*. By B. L. Robinson and J. L. Greenman.

Studies in Morphogenesis. 3. A Preliminary Catalogue of the Processes concerned in Ontogeny. By C. B. Davenport.

On the motion of the Recording Secretary, it was

Voted, That it is expedient to publish in the *Memoirs* Roland Thaxter's paper on Laboulbeniaceæ.

Eight hundred and seventy-sixth Meeting.

October 9, 1895. — STATED MEETING.

The PRESIDENT in the chair.

The chair announced the death of Edward Samuel Ritchie, Harold Whiting, and Henry Willard Williams, Resident Fel-

lows; Daniel Cady Eaton, William Wetmore Story, Associate Fellows; and Thomas Henry Huxley, Louis Pasteur, Sven Ludwig Lovén, and Carl Friedrich Wilhelm Ludwig, Foreign Honorary Members.

The Corresponding Secretary presented the following letters: from the International Catalogue Committee of the Royal Society of London; from the Royal Society of New South Wales, announcing the conditions of competition for its medal; from the Royal Academy of Sciences of Turin, announcing the death of its Secretary, Giuseppe Basso; from the family of Etienne Léopold Trouvelot, announcing his death; and from the Physico-economical Society of Königsberg, announcing the death of its Honorary President, Franz Ernst Neumann.

The following gentlemen were elected members of the Academy:—

Paul Sebastian Yendell, of Dorchester, to be a Resident Fellow in Class I., Section 1 (Mathematics and Astronomy).

Hammond Vinton Hayes, of Cambridge, to be a Resident Fellow in Class I., Section 2 (Physics).

Benjamin Kendall Emerson, of Amherst, to be a Resident Fellow in Class II., Section 1 (Geology, Mineralogy, and Physics of the Globe).

Marie Alfred Cornu, of Paris, to be a Foreign Honorary Member in Class I., Section 2 (Physics), in place of the late Hermann Ludwig Ferdinand von Helmholtz.

Jacobus Henricus van't Hoff, of Amsterdam, to be a Foreign Honorary Member in Class I., Section 3 (Chemistry), in place of the late Jean Charles Galissard de Marignac.

John Trowbridge exhibited and read extracts from a collection of letters written by Count Rumford to Marc Auguste Pictet, and presented to the Academy by Jules Marcou, who obtained them from the late Auguste de la Rive. It was thereupon

Voted, That the thanks of the Academy be tendered to Jules Marcou for his valuable gift.

Voted, That the letters be referred to the Rumford Committee and the Committee of Publication.

Eight hundred and seventy-seventh Meeting.

November 13, 1895.

The CORRESPONDING SECRETARY in the chair.

The chair announced the death of Asahel Clark Kendrick, an Associate Fellow.

A letter was read from Thomas W. Higginson, tendering his resignation as Councillor.

The following papers were presented by title:—

Thermo-electric Interpolation Formulæ. By Silas W. Holman.

Melting Points of Aluminum, Silver, Gold, Copper, and Platinum. By S. W. Holman, with R. R. Lawrence and L. Barr.

Pyrometry: Calibration of the Le Chatelier Thermo-electric Pyrometer. By Silas W. Holman.

Calorimetry: Methods of Cooling Correction. By Silas W. Holman.

On some Points in the Development of *Æcidia*. By Herbert M. Richards.

William E. Story gave an informal talk on the new methods of representing mathematical surfaces, and exhibited Platteau's apparatus and a variety of models.

Eight hundred and seventy-eighth Meeting.

December 11, 1895.

The Academy met at the house of the President, at Cambridge.

The PRESIDENT in the chair.

The resignation of Thomas W. Higginson as Councillor was accepted.

The following papers were read:—

On the Temperature of the Crust of the Earth at great Depths. By Alexander Agassiz and P. C. F. West.

Palestine in the Fifteenth Century B. C., according to recent Discoveries. By Crawford H. Toy.

Eight hundred and seventy-ninth Meeting.

January 8, 1896. — STATED MEETING.

The PRESIDENT in the chair.

The Corresponding Secretary read letters from A. Cornu and J. H. van't Hoff, acknowledging their election as Foreign Honorary Members ; and one from B. K. Emerson, accepting Fellowship.

The vacancies in the Council occasioned by the death of Henry W. Williams and the resignation of Thomas W. Higginson were filled by the election of

WILLIAM M. DAVIS, of Class II.,
HORACE E. SCUDDER, of Class III.

The following gentlemen were elected members of the Academy:—

Augustus St. Gaudens, of New York, to be an Associate Fellow in Class III., Section 4 (Literature and the Fine Arts), in place of the late William Wetmore Story.

Hermann Graf zu Solms-Laubach, of Strasburg, to be a Foreign Honorary Member in Class II., Section 2 (Botany), in place of the late Marquis de Saporta.

Carl Gegenbaur, of Heidelberg, to be a Foreign Honorary Member in Class II., Section 3 (Zoölogy and Physiology), in place of the late Thomas Henry Huxley.

Willy Kühne, of Heidelberg, to be a Foreign Honorary Member in Class II., Section 4 (Medicine and Surgery), in place of the late Charles Edouard Brown-Séquard.

The President alluded to the fact that the Massachusetts Historical Society had informally signified to the Academy its willingness to make a ten years' lease of quarters in its proposed building on the Back Bay. After a brief discussion, it was

Voted, That the question of securing new quarters for the Academy be referred to the Committee of Finance, to report at the next meeting.

On the motion of the Corresponding Secretary, it was

Voted, To meet, on adjournment, on the second Wednesday in February.

Edwin H. Hall presented by title a paper On the Thermal Conductivity of Mild Steel.

Henry Taber announced that he had proved the sufficiency of certain conditions that in Volume XLVI., page 583, of the *Mathematische Annalen*, he had shown to be necessary in order that a transformation of the group whose invariant is a certain linear complex may be generated by the repetition of an infinitesimal transformation of the group.

Eight hundred and eightieth Meeting.

February 12, 1896. — ADJOURNED STATED MEETING.

The PRESIDENT in the chair.

The chair announced the death of Martin Brimmer and Richard Manning Hodges, Resident Fellows.

The Corresponding Secretary read a letter from Augustus St. Gaudens, acknowledging his election as Associate Fellow.

The President reported that no change of quarters for the Academy was feasible at present.

George L. Goodale read a paper on Forestry under New England Conditions.

John Trowbridge gave an informal account of his experiments with the cathode rays.

No evidence of refraction was detected. Wooden lenses, both double convex and double concave, were tried, and apparently did not affect the rays. In Helmholtz's discussion of the electro-magnetic theory of light, there is a longitudinal wave which travels with an infinite velocity. Such a wave, travelling faster than the velocity of light, would not suffer refraction. The photographs procured by the new rays are not strictly shadow pictures, such as may have been obtained before in the electro-static field. They show a specific absorption which is a new phenomenon. For instance, a disk of microscopic cover glass, $\frac{1}{100}$ of an inch thick, perfectly transparent to the ordinary rays of light, throws as strong a shadow as a board one inch thick. The bones of the hand throw a stronger shadow than the flesh surrounding them.

The new phenomenon promises to be of great assistance in studying the extremities of the human body, and in detecting the presence of metallic bodies and fragments of glass in them. A shot, placed on the back of the hand, can be photographed through the flesh of the thickest portion of the hand. Of course, therefore, it could be detected if it were imbedded in the hand.

Pictures have been taken at the Jefferson Physical Laboratory, after an exposure of one minute, which show the bones of the hand, and there is no doubt that the time of exposure can be reduced to a few seconds for certain portions of the extremities. The Crookes tubes can be protected from injury by immersing their terminals in a suitable oil, — preferably, boiled linseed oil.

The following paper was read by title : —

On the Group of real Linear Transformations whose Invariant is an Alternate Bilinear Form. By Henry Taber.

Eight hundred and eighty-first Meeting.

March 11, 1896. — STATED MEETING.

VICE-PRESIDENT B. A. GOULD in the chair.

The Corresponding Secretary read letters from Carl Gegenbaur, W. Kühne, and H. Graf zu Solms-Laubach, acknowledging their election as Foreign Honorary Members; from the Natural History Society of Bonn, announcing the death of its Secretary, Philipp Bertkau; from the Joint Commission of the Scientific Societies of Washington, D. C., with regard to the proposition for a Director in Chief of Scientific Bureaus in the Department of Agriculture.

On the motion of the Corresponding Secretary, it was

Voted, To meet on adjournment on the 8th of April.

W. M. Davis read a paper on the Outline of Cape Cod.

C. L. Jackson made the following announcement : —

C. L. Jackson and A. M. Comey have found that potassic cobalticyanide is converted by boiling nitric acid into a red jelly, having the formula $\text{KH}_2\text{Co}_3(\text{CN})_{11}\text{H}_2\text{O}$, from which a silver salt, $\text{Ag}_3\text{Co}_3(\text{CN})_{11}\text{H}_2\text{O}$, and a barium salt, $\text{BaHCo}_3(\text{CN})_{11}\frac{1}{2}\text{H}_2\text{O}$,

were obtained. All of these substances have been analyzed. Potassic ferricyanide gives a similar black jelly under the same conditions.

On the motion of Eliot C. Clarke, the following resolutions were adopted : —

Whereas, The Committee on Coinage, Weights, and Measures of the National House of Representatives has reported a bill requiring the early adoption of the Metric System of Weights and Measures by all Departments of the Government, and its adoption by the whole nation, at a subsequent fixed date, as the only legal system, —

Resolved, That the American Academy of Arts and Sciences, renewing its recommendation made in former years, urges Congress to consider favorably this bill, and thus permit the United States to join the majority of civilized nations as regards its system of weights and measures.

Resolved, That this Academy believes that the universal adoption of this system will aid researches in physical science, and also commercial transactions, and will tend to bring about the fraternity of nations.

Resolved, That copies of these resolutions be sent to the presiding officers of the two Houses of Congress, to the Senators from Massachusetts, to the chairman of the Committee of Finance of the Senate, and to the chairman of the Committee on Coinage, Weights, and Measures of the House.

Eight hundred and eighty-second Meeting.

April 8, 1896. — ADJOURNED STATED MEETING.

The Academy met at the Walker Building of the Massachusetts Institute of Technology, Boston.

VICE-PRESIDENT B. A. GOULD in the chair.

The following gentlemen were elected members of the Academy : —

John Stone Stone, of Boston, to be a Resident Fellow in Class I., Section 2 (Physics).

Robert Wheeler Willson, of Cambridge, to be a Resident Fellow in Class I., Section 2.

Theobald Smith, of Boston, to be a Resident Fellow in Class II., Section 4 (Medicine and Surgery).

Charles Lane Poor, of Baltimore, to be an Associate Fellow in Class I., Section 1 (Mathematics and Astronomy), in place of the late James Edward Oliver.

Robert Simpson Woodward, of New York, to be an Associate Fellow in Class I., Section 4 (Technology and Engineering), in place of the late John Newton.

Basil Lanneau Gildersleeve, of Baltimore, to be an Associate Fellow in Class III., Section 2 (Philology and Archæology), in place of the late William Dwight Whitney.

Thomas Raynesford Lounsbury, of New Haven, to be an Associate Fellow in Class III., Section 2, in place of the late Asahel Clark Kendrick.

Karl Theodor Weierstrass, of Berlin, to be a Foreign Honorary Member in Class I., Section 1 (Mathematics and Astronomy), in place of the late Arthur Cayley.

Michael Foster, of Cambridge, Eng., to be a Foreign Honorary Member in Class II., Section 3 (Zoölogy and Physiology), in place of the late Carl Friedrich Wilhelm Ludwig.

Alexander Onufrijevič Kovalevskij, of St. Petersburg, to be a Foreign Honorary Member in Class II., Section 3, in place of the late Sven Ludwig Lovén.

Karl Weinhold, of Berlin, to be a Foreign Honorary Member in Class III., Section 2 (Philology and Archæology), in place of the late Sir Henry Creswicke Rawlinson, Bart.

Friedrich Hermann Grimm, of Berlin, to be a Foreign Honorary Member in Class III., Section 3 (Philosophy and Jurisprudence), in place of the late Sir John Robert Seeley.

On the motion of the chairman of the Rumford Committee, it was

Voted, To present the Rumford Medal by proxy at the annual meeting.

David G. Lyon gave an informal talk on recent Assyrian discoveries, with illustrations.

E. L. Mark presented the following paper by title:—

Preliminary Notes on the Embryology of the Starfish (*Asterias pallida*). By Seitaro Goto.